3.5A - Partitioning a Directed Line Segment

Bellwork

Graph the line in a coordinate plane.

1. $y = 6x$

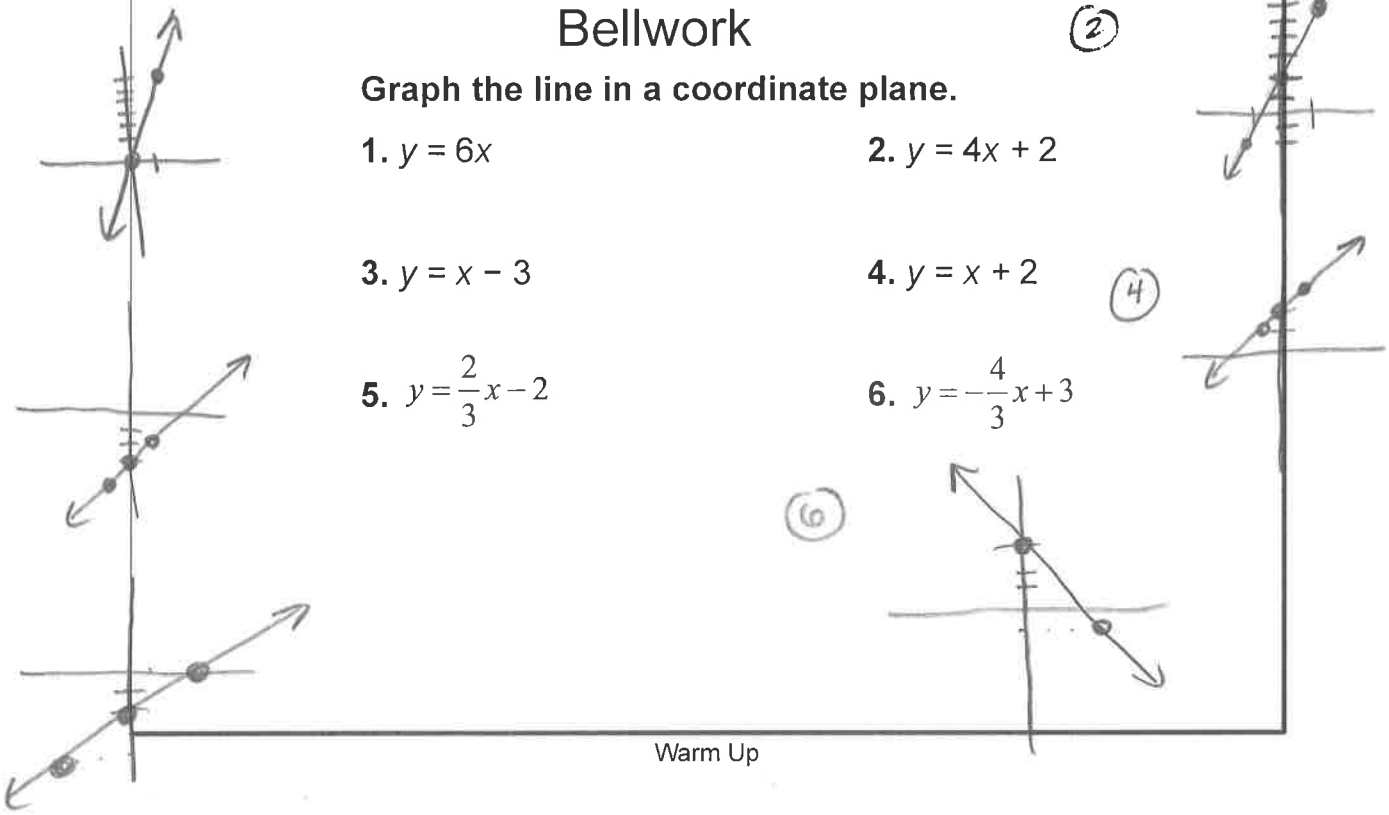
2. $y = 4x + 2$

3. $y = x - 3$

4. $y = x + 2$

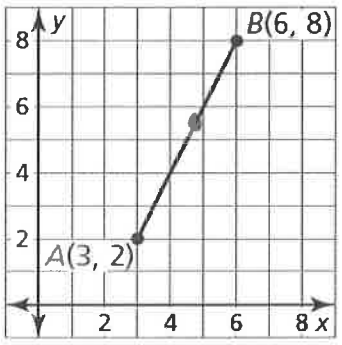
5. $y = \frac{2}{3}x - 2$

6. $y = -\frac{4}{3}x + 3$



Warm Up

Find the coordinates of point P along the directed line segment AB so that the ratio of AP to PB is 3 to 2.



- Ratio 3 to 2 means "3 parts to 2 parts", so there are a total of 5 parts.
Therefore, P is $\frac{3}{5}$ from A to B.

$X_P = X_A + \frac{3}{5}(X_B - X_A)$

$X_P = 3 + \frac{3}{5}(6-3)$

$X_P = 3 + \frac{9}{5}$

$X_P = \frac{15}{5} + \frac{9}{5} = \frac{24}{5}$

$Y_P = Y_A + \frac{3}{5}(Y_B - Y_A)$

$Y_P = 2 + \frac{3}{5}(8-2)$

$Y_P = 2 + \frac{18}{5}$

$Y_P = \frac{10}{5} + \frac{18}{5} = \frac{28}{5}$

$(\frac{24}{5}, \frac{28}{5})$

$(4\frac{4}{5}, 5\frac{3}{5})$

Example 1

Point of Division Formula (Finding a point that is not in the exact middle of a segment).

$x = x1 + t(x2 - x1)$ $y = y1 + t(y2 - y1)$

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Find the coordinates of point *P* along the directed line segment *AB* so that *AP* to *PB* is the given ratio.

1. *A*(l, 3), *B*(8, 4); 4 to 1

$t = \frac{4}{5}$

$X_p = X_A + t(X_B - X_A)$

$X_p = 1 + \frac{4}{5}(8-1)$

$= 1 + \frac{28}{5}$

$= \frac{5}{5} + \frac{28}{5}$

$= \frac{33}{5}$

$Y_p = Y_A + t(Y_B - Y_A)$

$Y_p = 3 + \frac{4}{5}(4-1)$

$= 3 + \frac{12}{5}$

$= \frac{15}{5} + \frac{12}{5}$

$= \frac{27}{5}$

$\left(\frac{33}{5}, \frac{27}{5}\right)$

2. *A*(−2, 1), *B*(4, 5); 3 to 7

$t = \frac{3}{10}$

$X_p = X_A + t(X_B - X_A)$

$X_p = -2 + \frac{3}{10}(4+2)$

$X_p = -2 + \frac{18}{10}$

$X_p = \frac{-20}{10} + \frac{18}{10}$

$= \frac{-2}{10}$

$= \frac{-1}{5}$

$Y_p = Y_A + t(Y_B - Y_A)$

$= 1 + \frac{3}{10}(5-1)$

$= 1 + \frac{12}{10}$

$= \frac{10}{10} + \frac{12}{10}$

$= \frac{22}{10}$

$= \frac{11}{5}$

$\left(-\frac{1}{5}, \frac{11}{5}\right)$

Monitoring Progress 1-2

Find the point that is 2/3 of the distance from *R* to *S*.

***R*(3, 2) and *S*(−3, −1)**

$x_p = x_R + t(x_S - x_R)$ $\quad$ $y_p = y_R + t(y_S - y_R)$

$x_p = 3 + \frac{2}{3}(-3-3)$ $\quad$ $y_p = 2 + \frac{2}{3}(-1-2)$

$x_p = 3 + \frac{2}{3}(-6)$ $\quad$ $y_p = 2 + \frac{2}{3}(-3)$

$x_p = 3 + (-4)$ $\quad$ $y_p = 2 + (-2)$

$x_p = -1$ $\quad$ $y_p = 0$

$(-1, 0)$

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Find the point that is 1/3 of the distance from *R* to *S*.

***R*(−4, 5) and *S*(2, −1)**

$x_p = x_R + t(x_S - x_R)$ $\quad$ $y_p = y_R + t(y_S - y_R)$

$x_p = -4 + \frac{1}{3}(2+4)$ $\quad$ $y_p = 5 + \frac{1}{3}(-1-5)$

$x_p = -4 + 2$ $\quad$ $y_p = 5 + (-2)$

$x_p = -2$ $\quad$ $y_p = 3$

$(-2, 3)$

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Homework:

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